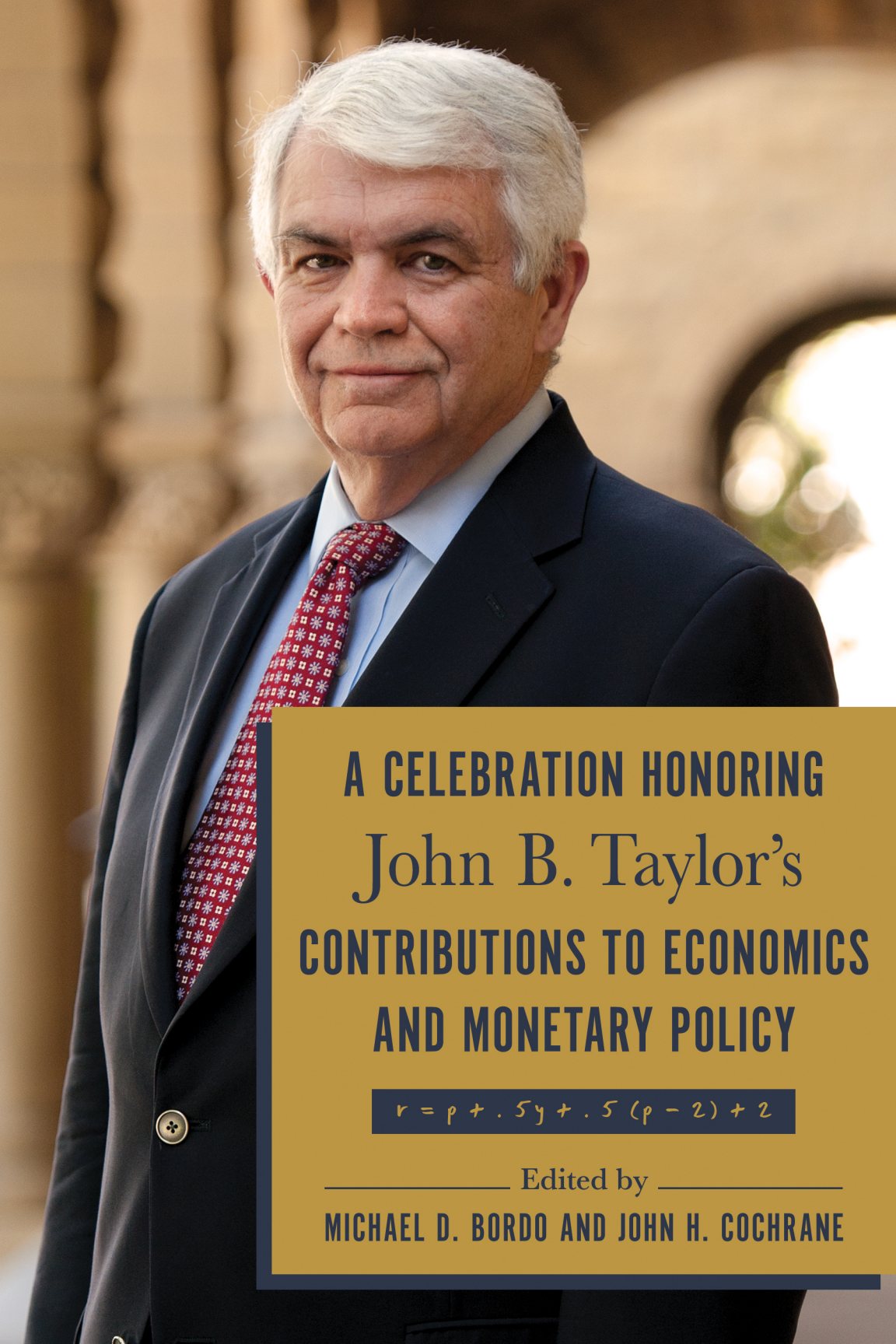

A CELEBRATION HONORING John B. Taylor's CONTRIBUTIONS TO ECONOMICS AND MONETARY POLICY

$$r = p + .5y + .5(p - 2) + 2$$

Edited by

MICHAEL D. BORDO AND JOHN H. COCHRANE

John Taylor and President Ford, January 1977

The White House, courtesy of John Taylor

Macro Policy Models, Rational Expectations, and Overlapping Contracts

Introduction

Andrew T. Levin

Many speakers at today's conference will be highlighting John Taylor's stellar research contributions. Thus, I would like to start this panel with a few brief remarks about John's stellar personal qualities, including some echoes of the gracious comments that we've just heard from Jonathan Levin.

Among the adjectives that are most apt in describing John Taylor, one consistent quality is John's modesty. Indeed, there might be someone who would eagerly organize a conference to highlight their own contributions to a field of study and who would carefully select each of the participants to say wonderful things about them. But I'm quite certain that John would never have organized a conference like this for himself. Consequently, we owe great thanks to Michael Bordo and John Cochrane and the others who organized this conference, and especially to Marie-Christine Slakey who worked tirelessly behind the scenes to make this event run smoothly. This auditorium is filled with devoted friends, colleagues, former students, and admirers who have cherished engaging with John for decades.

Another notable characteristic is John's sense of humor. This sense of humor has been readily apparent in the various classes that John has taught over the years. You've already heard Jonathan Levin's anecdote about John Taylor teaching a class while wearing a California raisin costume. In fact, many of my colleagues at Dartmouth College are extraordinary teachers, but I don't think any of them have ever dressed up as a raisin! John's humor has also been evident on some occasions where his daughter attended a class, sat in the front row, and started questioning key points in his lecture. And the students were a bit puzzled until finally realizing that this was aimed at encouraging all of them to engage with the substance of the issues at hand. Thus, many students have been inspired by John's devoted teaching.

However, the two qualities that make John truly extraordinary are the combination of his personal kindness and the courage of his convictions. You've already heard a bit about these qualities from Jonathan Levin and Michael Bordo, so I'll just elaborate a bit further.

As for kindness, we've already gotten plenty of data to verify this characteristic, so we just need a case study for illustrative purposes. So, here's just one example: I was a student in John's first-year graduate macro class during fall 1984 and later worked as a research assistant on his multicountry modeling project. John then became my dissertation advisor. In fall 1988 I was struggling to complete my job market paper, which had to be mailed out within a few days. And John said, "No worries, just come over to my house on Sunday and we'll sort it out." So, I came to John's house on a beautiful Sunday afternoon, and we spent nearly two hours sitting in his garden and editing my paper. I'm immensely grateful for that degree of kindness, which John has shown not only to me but to many, many others.

As for courage, you might not have noticed the relevant data in the chart that Mike Bordo showed earlier. In particular, the decade of the 1980s was the era of the real business cycle (RBC) models developed by Kydland and Prescott (1982) and Charlie Plosser (Long and Plosser 1983). However, monetary policy didn't have any role at all in those RBC models. So, John was practically unique in working on models with staggered nominal contracts that could be used to analyze the design of systematic monetary policies. Likewise, during the 1980s, New Keynesian economists were focused on analyzing static models with sticky prices and broadly dismissive of wages as a source of nominal inertia. Nonetheless, John's ongoing work on staggered nominal wage contracts was subsequently vindicated by the analysis of Christiano, Eichenbaum, and Evans (1999) and is now a standard feature of the dynamic stochastic general equilibrium (DSGE) models used by central banks around the world.

And it's very clear that this combination of kindness and courage is extremely rare. There are plenty of people who are kind but somewhat timid. And of course, there are people who have the courage of their convictions but tend to be quite blunt or even strident. (I probably fall into that category myself.) In contrast, John Taylor has this extraordinary combination of kindness together with the courage of his convictions.

To encapsulate John's personal qualities, it's helpful to take a brief look at the roots of the word *economist*, which derives from the Greek word *oikonomos*, meaning "steward" or "trustee." In Plato's *Republic* and other works,

famed Greek philosophers described a good steward as trustworthy, careful, and kind to those they serve. Likewise, the rabbinical scholars used *oikonomos* for Joseph (remember, the one with the rainbow-colored coat) as the great steward appointed by Pharaoh to plan and organize the grain storage during the cycle of feast and famine. In the New Testament, Jesus speaks about stewardship in many of his parables, asking the question: Who is the good and faithful steward? Literally, who is the good and faithful *oikonomos*? By extension, who is the good and faithful economist?

Fortunately, all of us have been privileged to know one remarkable person who fits these criteria: a truly extraordinary economist who is kind, courageous, respected, trustworthy, and wise. All of us are deeply grateful for the opportunity to engage with John Taylor over these decades.

References

Christiano, Lawrence J., Martin Eichenbaum, and Charles L. Evans. 1999. "Monetary Policy Shocks: What Have We Learned and to What End?" In *Handbook of Macroeconomics*, vol. 1A, edited by John B. Taylor and Michael Woodford, 65–148. Elsevier.

Kydland, Finn E., and Edward C. Prescott. 1982. "Time to Build and Aggregate Fluctuations." *Econometrica* 50 (6): 1345–70.

Long, John B., Jr., and Charles I. Plosser. 1983. "Real Business Cycles." *Journal of Political Economy* 91 (1): 39–69.

2

In Appreciation of John Taylor

Robert J. Barro

I would like to begin with the previously untold story of how I owe my position at Harvard to John Taylor. In 1983, John was an economics professor at Princeton, and he received an offer of a senior macroeconomics position at Harvard. John had a tough time deciding whether to go to Harvard. He went back and forth several times, at one point apparently accepting Harvard's offer and even buying a house near Harvard. There was a popular joke at the time, whereby one would display a graph showing a variable that moved rapidly between two points and then ask, "What does this graph depict?" The answer: "A Taylor series." In the end, John rejected Harvard's offer and also did not stay at Princeton, opting instead to go to Stanford, where he has remained since 1984.

Not long after this event, in 1985, I received a call from my former Harvard thesis adviser, Zvi Griliches. Zvi said that I had no doubt heard about John Taylor turning down Harvard's offer of a senior macro position. He said that this decision opened an opportunity for me, because I had been too long in the wilderness (by which he apparently meant the University of Rochester, where I was then located) and it was time to return to Harvard. He thought it would be good if I visited for a year and that hopefully this visit would turn into a permanent position. He asked what I thought of this idea, and I said that I would be interested. But then Zvi said that they had already decided to offer the visiting position to Tom Sargent, and he asked whether, should Tom turn them down, I would be interested? At this point, I was getting a bit nervous, but I said that I guessed that might work. But then Zvi said that should Tom turn them down, they had already decided to offer the position to Bob Shiller. Then he said, "I'll get back to you." Surprisingly, after this inauspicious start, it all worked out, and I visited Harvard in 1986, accepted a permanent position in 1987, and have been at Harvard ever since. So, thanks John for your inadvertent help in facilitating this.

Moving on to things more substantive, I want to say something about the Taylor rule, which is now one of the most famous ideas in economics. (An early expression of this idea is in Taylor 1993.) The rule constitutes a major contribution in three related respects. First, it enters as a component of standard macroeconomic models to express the central bank's adjustments of nominal interest rates in response to the state of the economy. Second, it serves as a normative prescription for the design of effective monetary policy. Third, it constitutes a positive theory of how nominal interest rates will behave in practice. Specifically, the rule says that the short-term nominal interest rate reacts positively and more than one-to-one to the inflation rate and positively to measures of output and employment.

In the main, the Taylor rule has functioned well in all three respects but particularly in recent decades as a positive theory of nominal interest rates. For example, it fits well for the United States since the early 1980s. However, a major deviation from the rule applied during the COVID crisis from 2020 until 2023 or 2024 in the United States and most of the Organisation of Economic Co-operation and Development (OECD). Specifically, the adjustment of nominal interest rates by central banks lagged dramatically behind the surges in inflation rates, particularly in 2021 and 2022.

Many observers have characterized the recent departures from the Taylor rule as major policy errors by the Federal Reserve and other central banks. But an alternative view starts with the recognition that the COVID crisis represented an emergency akin to a substantial war. Notably, there were surges in government expenditure in most OECD countries, though in the form of vast transfer payments rather than military outlay. From the perspective of the (consolidated) government's intertemporal budget constraint, there were three ways to pay for this large but likely temporary spending. First, the government could raise conventional taxes, either now or later. Second, the government could cut other forms of government spending, either now or later. Third, the government could effectively default on part of its debt obligations. For public debt denominated in domestic currency, a surge in inflation—unanticipated from the perspective of pre-COVID times—amounts to a partial default on the real debt. For example, if the price level effectively jumps upward by, say, 10%–15%, the real debt falls commensurately. This lowered real debt corresponds to a reduction by 10%–15% in the present value of primary real surpluses that the government has to run.

The idea of inflation contingent on wartime is familiar and is the basis for contingent fiscal policy in the model of Lucas and Stokey (1983). The

prototypical case in history is the United Kingdom's reliance on something akin to a gold standard from the Glorious Revolution of 1688 until the start of World War I in 1914. In normal times, the fixed nominal price of gold provided an anchor for the price level. The only meaningful departures from this system were the suspensions from 1797 to 1821 during the wars with France and again in 1914 for World War I. Correspondingly, there was substantial inflation and printing of money during the suspension periods, but the first one was followed by a return to gold at the previous parity, thereby according with sizable postwar deflation and a return to roughly the presuspension price level.

In my paper with Francesco Bianchi, we viewed the inflation surges in OECD countries from 2020 to 2023 as a reflection of implicit cooperation between monetary and fiscal authorities to help in dealing with the COVID fiscal emergency (Barro and Bianchi 2025). Such a contingent operation—inflating a lot in response to a major crisis—can be effective only if used sparingly, limited to clearly identified emergencies that resemble substantial wars.

From an empirical perspective for the OECD countries, the approach predicts that a country that has a larger surge in government spending in relation to GDP, particularly in 2020 and 2021, would see a larger surge in the price level. However, a connection of fiscal expansion to inflation would arise also in other frameworks, for example, in standard Keynesian macroeconomic models. The distinguishing feature of our approach comes from the emphasis on the effective "revenue" secured by inflating away public debt in the context of the government's intertemporal budget constraint.

One key mechanism is that a larger initial ratio of public debt to GDP (say in 2019) means that a smaller inflation surge is needed to generate a given amount of effective revenue. That is, if a lot of public debt is outstanding, a comparatively small inflation rate will eliminate a lot of real public debt. Therefore, other things equal, a country that had a higher debt-to-GDP ratio in 2019 is predicted to have a *lower* inflation rate from 2020 to 2023. This prediction, which turns out to be accurate, cannot be derived from standard macro models.

Secondly, a longer duration of the public debt means that the revenue effects from unanticipated inflation extend further out into the future. Therefore, if the government seeks to smooth out the boost to inflation, the prediction is that the inflation rate per year from 2020 to 2023 will be lower if the debt has longer duration.

The two additional mechanisms turn out to have a lot of explanatory power for the panel of OECD inflation rates from 2020 to 2023. In fact, if only the size of the fiscal surge is considered, the explanatory power for inflation

rates across the OECD countries turns out to be minor. The high overall explanatory power from our approach depends on the inclusion of the two additional mechanisms. These channels emerge naturally in the framework that relies on the government's intertemporal budget constraint but does not appear in standard macro models.

The basic insight is that an accommodating monetary policy, which accepted an inflation surge, effectively facilitated the financing of the dramatic boost to COVID-related government spending. Moreover, the inflationary monetary policy may have been reasonable from the perspective of optimal public finance if one takes as given the extent of the fiscal surge. This idea does not mean that the aggressive fiscal policy was itself a good idea. For example, for the United States, the expansion in transfer payments in 2020 may have been reasonable, given the economic crisis, but the additional surge in 2021 was likely way too large. Therefore, it is reasonable to blame a substantial part of the inflation on this excessive fiscal stance (given the way that monetary policy responded, conditional on the fiscal situation).

By 2024, the United States and other OECD countries seem to have returned to an inflation rate not much above the pre-COVID value, consistent with unchanged inflation rate targets in the vicinity of 2% per year. This pattern accords with the reversion of monetary policy in the developed world to the mechanism of the Taylor rule. Therefore, despite the major deviation during the COVID period, the Taylor rule continues to reign in the long run.

References

Barro, Robert J., and Francesco Bianchi. 2025. "Fiscal Influences on Inflation in OECD Countries, 2020–2023." *Economic Journal*: ueaf066.

Lucas, Robert E., Jr., and Nancy L. Stokey. 1983. "Optimal Fiscal and Monetary Policy in an Economy Without Capital." *Journal of Monetary Economics* 12 (1): 55–93.

Taylor, John B. 1993. "Discretion Versus Policy Rules in Practice." *Carnegie-Rochester Conference Series on Public Policy* 39: 195–214.

3

John Taylor, Persistence, and Systematic Policy

Robert G. King

It is an honor to participate in this conference celebrating John Taylor and his illustrious career.[1] I will take you back to some of his earliest research, specifically his *Econometrica* paper (Taylor 1979), which was pathbreaking and deeply influenced me and others of my generation.[2] In terms of elaborating the implications of rational expectations for the theory and practice of monetary policy, John worked where "the rubber meets the road": His operational macro theory was coupled with econometric strategies balancing computational feasibility, parameter parsimony, and data consistency with particular emphasis on persistence. His estimated models were used to construct operational policy rules, to discuss choice of policy regimes, and as background to consideration of specific historical episodes. From his earliest work, he argued that rational expectations meant that systematic policy is desirable. But he also highlighted limitations of simple policy formulations when there were unusual shocks or shifts in the policy regime.

Time Series Analysis and Control Theory

I have long been fascinated by intellectual connections in economics. Preparing this talk, I have puzzled some over why John was so influential for me. We have not been colleagues or collaborators. I have never estimated a Taylor rule for research purposes. And so on. But, as I prepared this discussion, I found many locations where I paralleled his training but with a lag, beginning with T. W. Anderson (2011) on econometrics generally and time series econometrics in particular.[3] I only wish that I'd had T. W. Anderson with me rather than just his book!

And Gregory Chow's work on analysis and control of dynamic economic systems, culminating in his monograph (1975), was inspirational to me as well as many other researchers, including—I suspect—John.

With that context, I am going to start by taking you back fifty years, to when a young researcher worked on a paper later delivered at the summer 1976 Econometric Society meetings in Ottawa.

The Pathbreaking Contribution

Fifty years ago, the rational expectations revolution had led many macroeconomists to be skeptical as to whether systematic monetary policy had real effects. John Taylor had a different view. Placing rational expectations at the center of his work, John Taylor aimed to estimate a small, dynamic structural model of US inflation and real activity and to calculate an optimal monetary-control rule compatible with the requirements of Robert Lucas (1976). The abstract is remarkable in its breadth and content (Taylor 1979; italics are mine):

> The paper investigates an *econometric method for selecting macroeconomic policy rules when expectations are formed rationally*. A simple econometric model of the U.S. is estimated subject to a set of rational expectations restrictions using *a minimum distance estimation technique*. The estimated model is then used to calculate *optimal monetary policy rules to stabilize fluctuations in output and inflation*, and *to derive a long run tradeoff between price stability and output stability* which incorporates the rationally formed expectations. *The optimal tradeoff curve is compared with actual U.S. price and output stability and with the results of a monetary policy rule with a constant growth rate of the money supply*.

Ultimately, results and rhetoric in John Taylor's research program changed how many central bank and academic economists think about monetary policy, even if central bank decision makers have not always followed his lead.

The Parsimonious Model

Given the persistence properties of US time series, as well as the challenge of estimation and control under rational expectations, the model construction was delicate. John's parsimonious model was shrewdly designed to capture univariate time series behavior familiar then and now, specifically an AR(2) for the output gap y and an IMA(1,1) for inflation π.[4] But it also included a monetary transmission mechanism for real balances $m - p$ in its aggregate demand equation (1) and selectively introduced rational expectations in various locations.[5]

$$y_t = \beta_1 y_{t-1} + \beta_2 y_{t-2} + \beta_3 (m_t - p_t) + \beta_4 (m_{t-1} - p_{t-1}) + \beta_5 \hat{\pi}_t + \beta_6 t + \beta_0 + u_t \quad (1)$$

$$\pi_t = \pi_{t-1} + \gamma_1 \hat{y}_t + \gamma_0 + v_t \quad (2)$$

where, to capture transitory components of inflation and its aggregate demand effect, John specified $u_t = \eta_t - \theta_1 \varepsilon_{t-1}$ and $v_t = \varepsilon_t - \theta_2 \varepsilon_{t-1}$.

Notably, viewing prices as set in advance, his accelerationist inflation specification in equation (2) included the expected output gap $\hat{y}$. Certain long-run homogeneity restrictions were imposed. The model was estimated with a minimum-distance technique.

In addition to being parsimonious, John's model was also shrewdly designed so that he could apply optimal control techniques as in Chow's classic 1975 monograph, despite the presence of rational expectations elements. The control variable was the money stock m_t. The state variables were past inflation π_{t-1}, the past inflation "transitory" shock ε_{t-1}, and output lags. The model was designed, therefore, to permit stabilization of real activity and to admit (or penalize) inflation accommodation.

Visualizing Policy Trade-Offs and Performance

One set of core policy conclusions was illustrated in now familiar ways (as in figure 3.1).[6] A quadratic objective led to the "Taylor curve," describing a trade-off between volatility of inflation and real activity.

John stressed that historical US performance had been inefficient, both absolutely and relative to a constant money-growth rule.

A Nearly Efficient Monetary Policy Rule

In a short follow-up paper (1981), John characterized his model's optimal policy (with the assistance of the control engineer David Livesey). A general money growth rule that allows responses to the states of the model economy is

$$m - m_{-1} = h_1 y_{-1} + h_2 (y_{-1} - y_{-2}) + h_3 (m_{-1} - p_{-1}) + h_4 \pi_{-1} + h_5 \varepsilon_{-1}$$

which reduces to a monetarist constant growth rate rule (CGRR) when all parameters are zero.

It can be challenging to explain the nature of policy rules derived from optimization problems, but John's analysis is remarkable in its analytical transparency and its link to policy. For optimal money-growth rules,

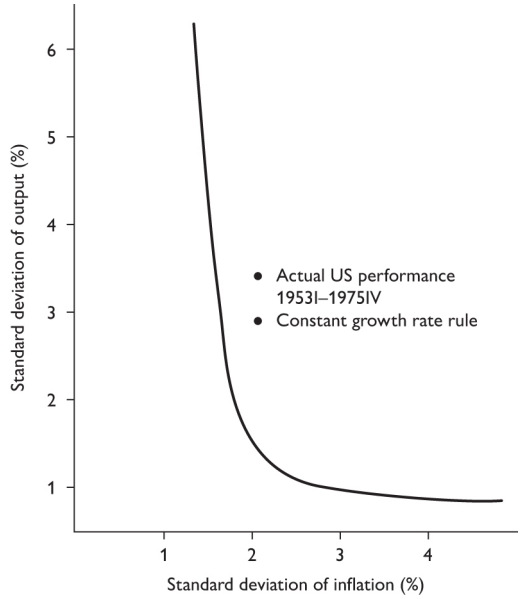

Figure 3.1. Visualizing policy trade-offs, performance
Source: Adapted from Taylor 1979

given the model coefficients in (1) and (2), there are two key findings. First, the money growth responses to real activity (h_1 and h_2) depend only on the aggregate-demand parameters governing persistence (β_1 and β_2) and the strength of contemporaneous real-balance effects on aggregate demand (β_3). Second, only one of the policy rule coefficients governing inflation responses is free.[7] John takes this to be h_4, describing it as the extent of inflation accommodation.[8]

Looking back at figure 3.1, the monetarist CGRR is inefficient (its point lies above the Taylor curve). John asks whether the inefficiency of the CGRR is due to lack of response to real activity or a lack of inflation accommodation. For his optimal money-growth rule, John reports that "the countercyclical parameters h_1 and h_2 . . . are large and negative (−1.81 and −.55, respectively) when evaluated at the estimated structural parameters." This behavior leads to the reduction in real variability in figure 3.1. But crucially, the optimal policy does not incorporate much accommodation of past inflation or past inflation shocks. John summarizes his findings thus: "The efficient rule is unlike the monetarist rule in its countercyclical reaction to the state of the economy (h_1 and h_2 are far from the zero values of the monetarist rule), but surprisingly

similar to the monetarist rule in not accommodating inflation (h_3, h_4 and h_5 are relatively close to zero)." That is, the lesson is that there is a nearly efficient policy rule that offsets demand-induced output movements while not accommodating inflation movements.

Inflation Accommodation and Credibility

In another short follow-up paper (Taylor 1982), John provided "a rational expectations viewpoint" on "establishing credibility" at a time when there was much debate and uncertainty over the policies of the Fed led by Paul Volcker. For economists interested in policy credibility in that period and in thinking about policy credibility more generally, that paper is a gold mine in terms of both general principles and specific aspects of history. But I will restrict my discussion to the themes raised by his early work (Taylor 1979).

John wrestled with characterizing the new Volcker policy and asked, "What is the rule change about which credibility is an issue in the current economic environment in the United States?" and noting, "That this question is not an easy one to answer . . . would itself seem like an obstacle to credibility."

Looking back, he found that "the old rule—that used on average for the last fifteen years or so—is not as difficult to characterize as the intended new rule." It contained "countercyclical elements: when the unemployment rate rose . . . the Fed reacted by increasing the rate of growth of money" and "except for some short-run episodes, the Fed appears to have accommodated or validated inflation by increasing money growth."

By contrast, he saw "the contemplated policy change" as including a "reduction in accommodation," noting that "cutting money growth when the inflation rate is high is clearly a move away from accommodation." At the same time, he reasoned that "if the new rule does not entail some counter-cyclical effects, its likely inferior performance would lead to doubts about its sustainability."

Despite the focus on money growth in his research to that point in his career, John gave a prescient warning about how interest rate targeting could lead to excessive accommodation, echoing and amplifying earlier concerns expressed by Milton Friedman and by William Poole.[9] He wrote: "Nominal interest rate targeting could easily result in accommodation of inflation, if nominal interest rates were not permitted [to] rise with the inflation rate."

From 1979 to 1982, the research program initiated by Taylor (1979) grew to become a core part of macroeconomics and monetary policy. Rather than

Chapter 3. Design of Fiscal, Monetary, and Financial Policies 63
The Design of Macroeconomic policy 63
Advantages of systematic policies 64
Importance of credibility 65
A new rule for fiscal policy 66
Monetary policy 77
The effect of monetary policy on the economy 77
The costs of inflation and recession 79
New challenges for monetary policy 80
The design of monetary policy in the 1980s and 1990s 84
Importance of a credible monetary policy 86
Summary of principles for monetary policy 88

Figure 3.2. Selection from the table of contents of the *Economic Report of the President (1990)*

Source: CEA (1990)

document the rest of the path, I now want to turn to commenting on a necessarily very selective part of John's work over the next four decades.

The 1990 Economic Report of the President

Fast-forwarding to the next decade, John brought the language of modern monetary and fiscal policy to the 1990 *Economic Report of the President* (after he had invented some of the rhetoric). Figure 3.2 highlights a few elements.

Written with Council of Economic Advisers (CEA) Chair Michael Boskin for the administration of President George W. Bush, that report (CEA 1990) makes one proud to be a certain type of macroeconomist. But it also highlights a path of fiscal discipline not taken.

Discretion Versus Policy Rules in Practice

I now turn to a couple of items related to the famous Carnegie-Rochester paper "Discretion Versus Policy Rules in Practice" (Taylor 1993a), which will be the subject of many talks at this conference. I read this multifaceted paper each year as part of teaching, and I am rewarded every time. Systematic policy as defined there can, of course, be bad as well as good.[10] Think back to the policy of the 1970s! Evaluating systematic policies requires a model, which is why the program set in motion by Taylor in 1979 is so important.

The Carnegie-Rochester paper gives us insight into Taylor as a policy advisor or policymaker, using the policy rule as a guide or rule of thumb but modifying it to deal with specific shocks, such as the energy price shock stemming from the invasion of Kuwait, where he reasons that no policy adjustment should occur because of the transitory nature of the shock. As

with his short 1980s papers discussed above and his macroeconomic policy monograph (Taylor 1993b), the Carnegie-Rochester paper is notable in its discussion of monetary policy during transitions: The Kuwait shock of 1991 occurred during the continuing US disinflation that had begun in the early 1980s.[11]

The Taylor Rule in Practical Policy Circa 2007

To fast-forward another decade to the mid-1990s, Federal Open Market Committee (FOMC) members had started reviewing the Taylor rule prior to meetings, using it as a "rule of thumb."[12] In 2007, St. Louis Fed President William Poole employed the Taylor rule as a vehicle for explaining monetary policy to the public while also highlighting that the short-term financial markets had learned about such systematic Fed behavior.

Poole saw the Fed—like the markets—as responding to new information, so that an unsophisticated observer would see it as unpredictable even under systematic policy.

Policy Rules in the Monetary Policy Report

Of course, the challenges of the Global Financial Crisis and its aftermath led to an abandonment of systematic interest rate policy, with the Fed seeing a constraint of the zero lower bound.

Some Fed economists—such as FOMC members Charles Plosser and Jeffrey Lacker—quickly pressed the FOMC to formulate systematic policy for credit market and long-term bond market interventions, but their statements in FOMC meetings at the time and subsequent comments (Lacker and Plosser 2024) display considerable frustration with that initiative.

In 2017, under Chair Janet Yellen, the Fed began to report implications of policy rules within a table in its *Monetary Policy Report* (*MPR*), although it skipped July 2020 as the COVID-19 pandemic intensified.

But later, as John Taylor documented in an essay (2022) honoring Marvin Goodfriend, the listed rules appeared disconnected from actual decisions, and the *MPR* table disappeared again in February 2022.

Periodic Policy Reviews

A new element of *MPR*s in recent years is the periodic policy review of strategy, tactics, and communication, with the most recent iteration taking place May 2025 (as of this writing). It is as hard to argue against this process as against the idea that individuals should have annual medical physicals. But

the prescription last time involved a downplaying of "preemptive policy" and a shift to an effectively higher average inflation target for a few years.

More generally, periodic policy reviews lead to challenges as well as opportunities. In particular, frequent reviews leading to new practices can make it difficult for the economy—the patient—to understand the systematic elements of the prescription and to interpret the consequences if these are not immediate.

To my mind, the experience with inflation in the wake of the first Fed policy review suggests important challenges for post-review policies this time around.[13]

Summing Up

In closing, I want to thank John for his monumental contributions over fifty years. Like others at this conference, I also want to celebrate his wide-ranging intellectual curiosity, his personal warmth, and his kindness toward many but particularly toward younger scholars.[14]

Notes

1. This discussion parallels slides and notes prepared for the conference. The figures included here are specific slides that capture the nature of the conference presentation materials.

2. For me, a reasonable definition of John's generation is the list of young macroeconomists whose working papers I devoured as a PhD student. And it is a remarkable collection including Robert J. Barro, Robert E. Hall, Robert E. Lucas Jr., Charles R. Nelson, Edward C. Prescott, Thomas J. Sargent, Robert J. Shiller, and Christopher A. Sims.

3. John's appreciation of T. W. Anderson as a teacher, colleague, and good friend is at https://economicsone.com/2016/09/24/the-statistical-analysis-of-policy-rules/.

4. Around the same time, Thomas Sargent employed a supply schedule featuring a similar AR(2) (Sargent 1976), and Charles Nelson and Bill Schwert introduced the IMA(1,1) model for inflation (Nelson and Schwert 1977).

5. Taylor's description of model variables is as follows: "y_t is the log of real expenditures measured as a deviation from trend, m_t is the log of money balances during period t, p_t is the log of aggregate price level prevailing during period t, π_t is the rate of inflation defined as $p_{t+1} - p_t$, $\hat{\pi}_t$ is the conditional expectation of π_t given information through period $t-1$, $\hat{y}_t$ is the conditional expectation of y_t given information through period $t-1$, and η_t and ε_t are random shocks to the output and inflation equations. The random vector (η_t, ε_t) is assumed to be serially uncorrelated with mean 0 and variance-covariance matrix Ω."

6. This slide from my presentation contains figure 3.1 from Taylor 1979.

7. The specific restrictions are presented in Taylor 1981.

8. Varying this coefficient, one can trace out the Taylor curve that we saw previously. A notable feature of this model is that the extent of inflation accommodation h_4 also pins down the response to transitory inflation component h_5.

9. Friedman's views are discussed in section 2 of Edward Nelson's contribution to this volume. Poole (1975) writes, "Policy implementation based on controlling the federal funds rate has permitted an undesirable pro-cyclical behavior of the money stock."

10. Taylor uses "systematic policy" as an alternative to "rule" to avoid certain prior controversies. My conference slides included "Systematic policy as a 'kinder, gentler' version of 'policy rule' (just kidding)." This description is alluded to in the conference discussion.

11. In fact, his focus on transitions predates the 1979 paper that I am celebrating: His 1975 *Journal of Political Economy* article analyzes "monetary policy during the transition to rational expectations."

12. Kahn, Asso, and Leeson (2007) document the entry of the Taylor rule into the FOMC beginning in the mid-1990s. On the topic of "rules of thumb," see Orphanides and Wieland (2008) for a masterful discussion that links Poole's early work on money stock rules of thumb with evidence on the empirical performance of a Taylor rule using Fed economic projections.

13. These recurrent transitions will provide opportunities for researchers interested in private-agent learning about shifts in policy rules.

14. I also want to thank the conference organizers, whose invitation led me to a rewarding reexamination of John's persistent advocacy for systematic and credible policy.

References

Anderson, Theodore W., ed. 2011. *The Statistical Analysis of Time Series*. Wiley.

Chow, Gregory C. 1975. *Analysis and Control of Dynamic Economic Systems*. Wiley.

Council of Economic Advisers (CEA). 1990. *Economic Report of the President*. Executive Office of the President. US Government Publishing Office, available at https://fraser.stlouisfed.org/title/economic-report-president-45/1990-8161.

Kahn, George A., Pier Francesco Asso, and Robert Leeson. 2007. *The Taylor Rule and the Transformation of Monetary Policy*. Hoover Institution Press.

Lacker, Jeffrey M., and Charles I. Plosser. 2024. "The Fed Should Improve Communications by Talking About Systematic Policy Rules." In *Getting Monetary Policy Back on Track*, edited by Michael D. Bordo, John H. Cochrane, and John B. Taylor, 345–70. Hoover Institution Press.

Lucas, Robert E. 1976. "Econometric Policy Evaluation: A Critique." *Carnegie-Rochester Conference Series on Public Policy* 1: 19–46.

Nelson, Charles R., and G. William Schwert. 1977. "Short-Term Interest Rates as Predictors of Inflation: On Testing the Hypothesis That the Real Rate of Interest Is Constant." *The American Economic Review* 67 (3): 478–86.

Orphanides, Athanasios, and Volker Wieland. 2008. "Economic Projections and Rules of Thumb for Monetary Policy." *Federal Reserve Bank of St. Louis Review* 90 (4): 307–24.

Poole, William, 1975. "The Making of Monetary Policy: Description and Analysis." *Economic Inquiry* 13 (2): 253–65.

Poole, William. 2007. "Understanding the Fed." *Federal Reserve Bank of St. Louis Review* 89 (1): 3–14.

Sargent, Thomas J. 1976. "A Classical Macroeconometric Model for the United States." *Journal of Political Economy* 84 (2): 207–37.

Taylor, John B. 1975. "The Monetary Transmission Mechanism: An Empirical Framework." *Journal of Political Economy* 103 (5): 1019–50.

Taylor, John B. 1979. "Estimation and Control of a Macroeconomic Model with Rational Expectations." *Econometrica* 47 (5): 1267–86.

Taylor, John B. 1981. "Stabilization, Accommodation, and Monetary Rules." *The American Economic Review* 71 (2): 145–49.

Taylor, John B. 1982. "Establishing Credibility: A Rational Expectations Viewpoint." *The American Economic Review* 72 (2): 81–85.

Taylor, John B. 1993a. "Discretion Versus Policy Rules in Practice." *Carnegie-Rochester Conference Series on Public Policy* 39: 195–214.

Taylor, John B. 1993b. *Macroeconomic Policy in a World Economy: From Econometric Design to Practical Operation*. W. W. Norton.

Taylor, John B. 2022. "Interest Rate Policy." In *Essays in Honor of Marvin Goodfriend: Economist and Central Banker*, edited by Robert G. King and Alexander L. Wolman, 303–13. Federal Reserve Bank of Richmond. https://www.richmondfed.org/publications/research/goodfriend/taylor.

4

Standing on the Shoulders of a Giant: John B. Taylor

Harald Uhlig

John Taylor is a giant of our profession. Economic analysis has changed in material ways due to his seminal contributions. We all can be immensely grateful for his insights and for allowing us to see far, standing on his shoulders.

I have particular reasons to be thankful. When I was a graduate student at the University of Minnesota and a research assistant for and PhD student of Christopher Sims, I got involved in a comparison of numerical solution methods. Various such methods had then been recently proposed for solving dynamic stochastic general equilibrium models. With the help of a National Science Foundation grant, Sims and Taylor had formed a group aimed at comparing the various methods. For a conference at the University of Minnesota, the researchers were instructed to submit simulations of the model, based on their solution method. I believe that Chris Sims had originally planned to perform the comparison himself but then decided to hand this task to me. For me as a young PhD student, this was, of course, a wonderful opportunity. I produced a number of plots and tables, highlighting similarities and differences. Someone pointed me to the newly developed Den Haan–Marcet (1994) statistic, as a way of assessing accuracy via examining the predictability of the Euler equation residual, and so I did. Since all the numerical methods were meant to be described individually in a special issue for the *Journal of Business and Economic Statistics*, a summary or comparison paper was needed. John Taylor amazingly offered me the opportunity to collaborate on writing it. We became coauthors and published the paper as Taylor and Uhlig (1990). The paper has become a benchmark in that literature, with many citations, and future comparisons of further advances in that literature often draw back on it. I am immensely grateful to John Taylor and to Chris Sims for this extraordinary opportunity to collaborate on that comparison paper. This incredible experience had a considerable impact on my career.

Many years later, John Taylor approached me to ask whether I would be willing to become coeditor with him for a new version of the *Handbook of Macroeconomics*, and I, of course, gladly agreed. In addition to the Taylor and Uhlig (2016) *Handbook*, our work also generated two exciting and influential conferences, one at Stanford and one at Chicago, with the authors of the various chapters.

John Taylor is better known, though, for his early work on rational expectation models, amended with versions of price and wage stickiness, and for his famous "Taylor rule" for conducting monetary policy. Others will examine the latter in more depth, so allow me to focus on the former.

To set the stage, let us travel back to the 1970s and the rational expectations revolution in macroeconomics, kicked off by John Muth, Robert E. Lucas Jr., Thomas J. Sargent, Neil Wallace, and Chris Sims. What a time it must have been! With rational expectations, agents use model-consistent mathematical expectations to forecast the future. They are neither optimistic nor pessimistic: They are realistic. They cannot be systematically fooled. But systematically fooling agents was in essence at the core of the widely accepted Keynesian policy prescriptions of those days. As an example, the Phillips curve showed a trade-off between inflation and unemployment and was explained by wages set in advance of inflation. If one could fool workers into believing inflation to be low, but then subsequently create high inflation anyway, workers would be cheated out of their expected real wage earnings, firm demand for the now cheap labor would swell, and unemployment would decline. This line of reasoning allowed for systematically countercyclical policies by systematically fooling the workers all the time. On the face of it, this is a rather shameful approach, but it was remarkably popular (and perhaps never expressed so bluntly by its proponents).

The rational expectations revolution upended this reasoning. In a world where the plans of policymakers for future inflation are transparent, workers cannot be fooled into believing in something else but would rationally foresee the inflation about to materialize. Consequently, forecastable parts of monetary policy have no effect on output in a world where wages and prices can be freely adjusted considering such expectations, as Sargent and Wallace (1975) famously demonstrated. Old Keynesianism was dead. But the belief that forecastable parts of monetary policy can affect the economy was not. Even though the arguments laid out by Sargent and Wallace were compelling, the central conclusion was not. Many thought that the conclusion was an implication of rational expectations itself, making the latter assumption unpalatable for some.[1]

Enter John Taylor. In Phelps and Taylor (1977) and in Taylor (1979a, 1980), he argued that wage and price contracts of sufficient duration can give rise to non-neutrality of systematic monetary policy changes, even if expectations are rational. The latter two Taylor papers propose staggered contracts as a resolution. Say, wage contracts last for a year, but some are reset in January and some are reset in July. At the time of resetting, the market participants will have to consider not only the still-existing and non-reset wage contracts from the past but also the to-be-reset wage contracts in the future. As a result, the wage-setting solution becomes a lot richer, and shocks will have impacts that last well beyond the duration of the contracts themselves. Put differently, even if wage contracts today fully anticipate monetary policy changes in the future, those monetary policy changes can nonetheless have real effect on the workers currently resetting their wage and on the workers resetting their wages in the future, because of the overhang of past contracts. This is a powerful idea. One can and should argue that it rescued rational expectations by freeing it from being tied to the untenable prediction of monetary policy ineffectiveness while rescuing its clean logical underpinning. Macroeconomists have assumed rational expectations ever since.

Using a simple version of the equation (1) in Taylor (1980), the wage-setting procedure can be described as

$$x_t = b\ x_{t-1} + d\ E_{t-1}\left[x_{t+1}\right] + \gamma\ E_{t-1}\left[b\ y_t + d\ y_{t+1}\right] + \in_t \qquad (1)$$

where x_t is the wage to be reset at date t for the duration of the contract (here: two periods); y_t is a "measure of excess demand" in period t, a precursor of the "output gap" in Taylor's later work; ε_t is a random disturbance; $E_{t-1}[\cdot]$ indicates a rational expectation to be formed at time $t-1$; and b, d, and γ are coefficients. The equation is not derived from first principles, but rather it is postulated to hold.

Thinking about it more reveals that matters may not be so easy. If workers are perfect substitutes, then firms would hire first the workers with the lowest wages: There would be a pecking order. Here, a better approach would consider workers to be heterogeneous, with firms facing a probabilistic discrete-choice problem as in McFadden (1981). Alternatively, the contracts are between a firm and a worker resulting from bargaining, considering the outside option of unemployment and an idle position for one period, and seeking to find a job or find a worker for the next period, as in the literature surveyed by Rogerson, Shimer, and Wright (2005). These approaches had not yet entered the

vocabulary or thinking of macroeconomists at the time or were developed later: John Taylor cannot have relied on them back then. But perhaps the time has come to resurrect the investigation of staggered contracts and to reformulate John Taylor's insights in light of this additional literature.[2] The currently most popular version of staggered contracts is the version proposed by Calvo (1983), where contracts last infinitely long, unless they get terminated at some random time. John B. Taylor's formulation strikes me as more realistic and more relevant, though Calvo's approach is easier for calculations. Comparisons of various approaches to price and wage stickiness such as Alvarez and Lippi (2014) or Alvarez, Le Bihan, and Lippi (2016) have put the original Taylor (1979a, 1980) formulation into a new context and shown the degree to which its implications are different from others. In short, his approach is very much alive.

John Taylor then proceeded to fully estimate rational expectation macroeconomic models with staggered price or wage contracts, and he suggested utilizing them for policy analysis. See Taylor (1979b) and Taylor (1994). It is remarkable that large-scale Old Keynesian models still are the main engines of analyzing economic developments and forecasts at large public institutions or the private sector. Taylor's work should be seen as pathbreaking and pointing the way to replace these with more modern formulations, respecting rational expectations. In turn, Taylor's work is the precursor to the current benchmark of estimated dynamic stochastic general equilibrium models with rational expectations such as Smets and Wouters (2007), which have indeed made some inroads into quantitative policy analysis at large public institutions. That agenda is not fully completed, as one can see by the contrasting approaches still in use today.

In conclusion, John Taylor's contributions have been pathbreaking and have changed the profession. He truly is a giant, on whose shoulders we get to stand to see far. I have tried to do even better than that. I have chosen not only to stand on his shoulders intellectually but also to stand behind his shoulders, when the opportunity arose (see figure 4.1).

Notes

This paper was written while I was a technical advisor at the Bank for International Settlement. I am grateful for its hospitality.

1. Sargent himself typically regarded rational expectations as resulting from or the limit case of efforts by agents using econometric tools to calculate forecasts based on available past and present data; see Uhlig (2012). This can reintroduce versions on non-neutrality.

Figure 4.1. Photo from the *Handbook of Macroeconomics* conference at Stanford and at the University of Chicago, 2015, with Harald Uhlig standing behind John Taylor
Courtesy of Harald Uhlig

2. There already is a literature proceeding along these lines, and I will not attempt a survey here. As one example, see Gertler and Trigari (2009).

References

Alvarez, Fernando, Hervé Le Bihan, and Francesco Lippi. 2016. "The Real Effects of Monetary Shocks in Sticky Price Models: A Sufficient Statistic Approach." *American Economic Review* 106 (10): 2817–51.

Alvarez, Fernando, and Francesco Lippi. 2014. "Price Setting with Menu Cost for Multiproduct Firms." *Econometrica* 82 (1): 89–135.

Calvo, Guillermo A. 1983. "Staggered Prices in a Utility-Maximizing Framework." *Journal of Monetary Economics* 12 (3): 383–98.

Den Haan, Wouter J., and Albert Marcet. 1994. "Accuracy in Simulations." *Review of Economic Studies* 61 (1): 3–17.

Gertler, Mark, and Antonella Trigari. 2009. "Unemployment Fluctuations with Staggered Nash Bargaining." *Journal of Political Economy* 117 (1): 38–86.

McFadden, Daniel. 1981. "Econometric Models of Probabilistic Choice" in *Structural Analysis of Discrete Data with Econometric Applications*, edited by C. F. Manski and D. McFadden. MIT Press.

Phelps, Edmund S., and John B. Taylor. 1977. "Stabilizing Powers of Monetary Policy Under Rational Expectations." *Journal of Political Economy* 85 (1): 163–90.

Rogerson, Richard, Robert Shimer, and Randall Wright. 2005. "Search-Theoretic Models of the Labor Market: A Survey." *Journal of Economic Literature* 43 (4): 959–88.

Sargent, Thomas, and Neil Wallace. 1975. "'Rational' Expectations, the Optimal Monetary Instrument, and the Optimal Money Supply Rule." *Journal of Political Economy* 83 (2): 241–54.

Smets, Frank, and Rafael Wouters. 2007. "Shocks and Frictions in US Business Cycles: A Bayesian DSGE Approach." *American Economic Review* 97 (3): 586–606.

Taylor, John B. 1979a. "Staggered Wage Setting in a Macro Model." *The American Economic Review* 69 (2): 108–113.

Taylor, John B. 1979b. "Estimation and Control of a Macroeconomic Model with Rational Expectations." *Econometrica* 47 (5): 1267–86.

Taylor, John B. 1980. "Aggregate Dynamics and Staggered Contracts." *Journal of Political Economy* 88 (1), 1–23.

Taylor, John B. 1994. *Macroeconomic Policy in a World Economy: From Econometric Design to Practical Operation*. W. W. Norton.

Taylor, John B., and Harald Uhlig. 1990. "Solving Nonlinear Stochastic Growth Models: A Comparison of Alternative Solution Methods." *Journal of Business and Economic Statistics* 8 (1): 1–17.

Taylor, John B., and Harald Uhlig, eds. 2016. *Handbook of Macroeconomics, Vol. 2A/B*. Elsevier, North Holland.

Uhlig, Harald. 2012. "Agents as Empirical Macroeconomists: Thomas J. Sargent's Contribution to Economics." *Scandinavian Journal of Economics* 114 (4): 1055–81.

GENERAL DISCUSSION

Andrew T. Levin: I'm going to take the prerogative as the chair to ask for an interaction between the two Bobs, Barro and King. Of course, Harald Uhlig can jump in too.

Bob King, you talked about how the Taylor rule paper, which is a Carnegie-Rochester paper, was a "kinder and gentler" approach to monetary policy rules. John emphasizes in that paper that it's not a rule that can be followed mechanically and blindly, that you need good judgment. And if you're going to deviate from the rule, you do it carefully and you explain why.

So the question for the two of you is to what extent, if it was appropriate for the Fed to be supportive of fiscal policy in 2021, was that transparent? Was it systematic? Was it accountable? Was it prudent? Was it consistent with optimal control? You have done work on optimal monetary and fiscal policy. The Taylor rule is designed to serve as a benchmark, not a mechanical rule. So perhaps this is a good case study for considering when the Fed should deviate from that sort of benchmark?

Robert J. Barro: I was thinking about the deviation from the Taylor rule starting from 2020 as perhaps being a reasonable response in the context of an emergency situation. But I'm sure if you talk to anybody at the Federal Reserve, some of which I've done, they wouldn't describe what they did in those terms. They wouldn't say that they purposely engineered this inflation surge, and we had a good reason for doing it. They would say that they didn't understand initially that the inflation surge was setting in and that was why they reacted very slowly in terms of adjusting interest rates.

In particular, they would say that initially they thought it was a transitory problem, not a longer-lasting one. So I'm taking it as an as-if proposition [people often behave "as if" they are rational optimizers, even if they don't explain their actions that way], looking at it as though the monetary and fiscal authorities were cooperating, or that the fiscal authority was leading the way through fiscal dominance, and then figuring out how that result might be seen as a kind of optimal contingent response to the emergency, including the vast increase of expenditures. From that viewpoint, we get a set of predictions, and the predictions seem to work well. But that analysis doesn't mean that literally, if you talk to the central bankers, that they're going to describe what they did in those terms.

In general, I don't think it's a useful form of doing economic research to go to survey people and ask them, "Why did you do what you did?" I wouldn't do that in terms of firms setting prices. Here I'm taking the same approach with respect to central bankers. I don't think going and asking them, "Why did you do what you did in this case with respect to interest rates?" is going to be productive in understanding what happened.

Robert G. King: I'm just going to make one short point. I have substantial concerns about the boundaries of the Federal Reserve System. I think it undertakes a lot of actions that are fiscal in nature. Now, Robert may say these are good. I don't think always they are. I think we need to have sharper lines. I've read twenty-five Taylor papers in the last month. Wanting to establish the boundaries of the central bank comes through in a number of John's papers as well.

Barro: There's obviously a tension here because it's important that the central bank be committed to something that looks like price stability. And then if you get to deviate from that by declaring an emergency, it obviously has potential problems. That's why this kind of contingent reaction only works if it's very limited to clear emergency-type situations of which the most obvious example is wartime.

So that's why I thought that the COVID experience was analogous to war and that you might get away with that deviation to get a kind of efficient form of public finance to pay for a substantial part of the spending surge. But there is this tension, which has to do with the importance of commitment of the central bank to something like price stability.

Levin: One of the contributions that Michael Bordo emphasized is how John Taylor and others here started this series of monetary policy conferences. I think over the years, many of us have been to many of them. Those have been really important. I think back three or four years ago. Monika Piazzesi gave the dinner talk about how the Fed's policy was far below the prescriptions of the Taylor rule and how it probably needed to raise rates to 5% or more at a time when rates were still close to zero. There were some people in that audience who seemed startled by the notion that rates might need to be raised to 5%. But as it turned out, getting back to following the Taylor rule was the right thing to do.

Lee Ohanian: Thanks to Robert Barro, Bob King, and Harald Uhlig for some really interesting comments. And Andy, thanks for moderating.

What's remarkable about John is that he's at the forefront of all four of the challenging aspects of macroeconomics: theory, econometrics, computation of equilibrium, and putting them all together within applied work. His time must have been in so much demand, and yet he found the time to be one of the leading macroeconomists of the twentieth century and also a very committed public servant to our country.

So, John, thank you for doing that so much.

Would any of the panelists like to pick up other John Taylor papers that weren't discussed? John, your work on the theory of convergence to rational expectations was really influential. It influenced some of Tom Sargent's work, and the work of [George] Evans and [Seppo] Honkapohja. Also your work on non-uniqueness in rational expectations models was very important. Your work with Ray Fair on solving nonlinear models was way, way ahead of its time, in my opinion. And then to top all that off, you used full-information methods to estimate parameters long before it was popular. Even then it oftentimes was somewhat looked down upon, at least when I was on the faculty at the University of Minnesota. But I think we know how that debate advanced over time.

Sebastián Edwards: This is a great session and thanks to John Taylor. One of the things that I loved about this session is the history of thought component, and the fact that Bob and Harald and also Robert Barro went back all the way to the late 1970s and how influential John Taylor was. I'll get back to that during the last session.

But I think that this is a great opportunity to ask Robert Barro whether the Barro–Gordon model was impacted by John Taylor's early work, including the *Econometrica* 1979 paper and the 1980 paper. I was at Chicago, I was a classmate of David Gordon, so I remember the Barro–Gordon model well. What's the connection, now that we're talking about things that happened at that time and that were very influential?

Barro: Well, the most influential paper at the time for us was Kydland and Prescott, which we were thinking about.

David Gordon had been working on his PhD thesis at the University of Chicago under Bob Lucas at the time. And he came to Rochester, and then we talked about things. I remember only two times that I worked out a paper very quickly. I worked out that paper on an airplane using the guidance I'd gotten from David beforehand in terms of what he was working on. In terms of my remarks on the importance of commitment of the central bank, a lot of that is related to the work that I did at the time with David. David, by the way, was a ballet dancer as well. I don't know whether you know that.

Levin: This is yet another connection to Michael Bordo's timeline, which noted the ongoing debate throughout the 1980s and 1990s about whether macroeconomists should focus on sticky prices or sticky nominal wages. Then, finally, Larry Christiano, Marty Eichenbaum, and Charlie Evans wrote a landmark paper that encompassed both types of stickiness, and they estimated a model that was built up partly from Kydland and Prescott but also from John Taylor's seminal contribution of staggered wage and price contracts. And it turned out that sticky nominal wages were a key feature of the model. Their paper paved the way toward a lot of the work that's been done at many central banks around the world about thinking about systematic policy and comparing policy rules. Many of the models that Volker Wieland has in his database trace back to that work.

Michael J. Boskin: I have a question for Robert Barro. In your research that you were quoting, did you look at the share of public debt that's externally held? Because one might think it's a lot easier to default on foreigners than your own voters.

Barro: We were looking at the mechanism of surprise inflation as a way to wipe out real value of public debt. So given that the emphasis is on domestically

denominated public debt, US dollar debt in the context of the United States, foreign debt would be different. Foreign currency–denominated debt, which is particularly important for other countries, would be different. Inflation-indexed debt would also be different. You wouldn't have the same mechanism for essentially having a capital levy on the real value of the debt through surprise inflation.

Boskin: I wasn't interested in foreign-denominated debt. I was interested in US dollar debt held by foreigners. A large fraction of our debt is held externally by foreign central banks, by foreign pension funds, insurance companies, etc.

Barro: There's a paper by Jaume Ventura related to that, for example. He argues that it's important that debt held by foreigners and debt held by domestic residents be pooled into a common market, basically as a way for the fiscal and monetary authorities to commit not to wipe out the debt that's held by the foreigners. And he argues that that's important to be able to issue debt to foreigners in the first place, that it's an important commitment device to repaying debt. This didn't come up so much in the current research that we were doing, but there's other work related to that.

John H. Cochrane: I want to pick up on the deviations from the Taylor role that several of you mentioned, because I think that's really important.

My office was next to John's for several of my first years at Hoover, which was wonderful. But I learned you can get John grumpy. Here's one way to get John grumpy: Say that the Fed should follow the Taylor rule as a mechanical rule. I never did this, but I saw other people make that mistake.

John will get very grumpy if you say that, because that's not the idea. John's genius was to create a framework or a strategy for policymaking building off the rule, not as something mechanical. There are supposed to be deviations. The Fed should compute the rule, look at the rule's recommendations, and then explain if it's going to do something different.

That doesn't mean that the Fed should never deviate. You brought up some examples. Two have come to mind recently: In the depths of COVID, the unemployment rate was something like 25%. There was a catastrophic fall in output, about 10%. Well, 0.5 times 10% means lowering the funds rate 5 percentage points by the Taylor rule.

But it would not have been appropriate to meet that fall in output with a huge monetary stimulus. A pandemic was raging, not lack of demand. This was a time to say, Here's what the Taylor rule says, here's why we're not doing it.

Another example might be right after 9/11. The Fed saw a terrorist attack, set interest rates to zero, and flooded the economy with money. Of course, inflation, GDP, and unemployment hadn't gone anywhere yet. That's another time to say, Here's the Taylor rule, and here's why we're not following it right now.

The Taylor rule wakes you up. The Fed in 2021 might have said, "Whoa, inflation is surging. The Taylor rule says, 'Do something!' Why are we not doing something?" It helps to wake you up, helps you to not make discretionary policy mistakes. It also anchors expectations by focusing on the big-picture issue. The Fed will, in the end, do what it takes to respond to a big inflation, no matter what complex deviations may happen along the way.

If you work out an optimal policy calculation, of course, the Fed should respond to 527 different variables, according to the assumed model. Well, models differ. And of course, that sort of response is very hard to communicate to people, to make the Fed accountable, and to be the benchmark for expectations about how the Fed will act in the future.

John chooses the two most important variables. That signals where the Fed is going in the long-run future, so it stabilizes expectations. Then, the Fed explains why it's doing things otherwise. It's a framework for policy, the foundation of a systematic strategy, not a mechanical rule.

Lots of us come up with equations. John turned equations into a systematic framework for policy that you deviate from sometimes for good reasons, and you deviate sometimes for bad reasons. Don't do those.

Levin: I want to close with an analogy that builds on what Harald said earlier about standing on the shoulders of giants. If you're at an airport or bus terminal or Grand Central Station and you're looking for someone, it really helps a lot if they're tall, because you can see their head sticking out over everyone else.

In some way, that's what we think of as a giant. The giant is someone who can look way ahead, who can see things that other people can't see yet. That's John Taylor. As one more example, the Fair–Taylor algorithm that they devel-

oped decades ago was specifically designed for solving nonlinear models. What's been starting to happen in macroeconomics more recently is recognition of crucial nonlinearities like the zero lower bound and the nonlinear Phillips curve. So, John Taylor was the giant who could see over the top of the crowd and make contributions that are still very important many, many years later.

Thank you again, John, and thanks to our panelists.